Strut effectiveness factor for reinforced concrete deep beams under dynamic loading conditions

ABSTRACT

In a current study, a new strut effectiveness factor based on Strut-and-Tie Model (STM) is proposed to assess the ultimate shear strength of reinforced concrete (RC) deep beam subjected to dynamic loads. The derivation of the new effectiveness factor of concrete struts is based on Mohr–Coulomb criterion failure. Two types of concrete failure, diagonal splitting and concrete crushing failure modes, are proposed and examined. The modification of the proposed model is simulated in a MATLABSIMULINK environment. The proposed model exhibits efficiency in assessing dynamic shear resistance for deep beams. Moreover, a parametric study is then conducted to examine the effect of flexural reinforcement ratio, transverse reinforcement and shear-span to depth ratio on shear behavior of RC deep beams with consideration of the changes in strain rate. The proposed effectiveness factor is validated by utilizing the experimental results obtained from the literature and shows good accuracy for prediction the shear strength of reinforced concrete deep beams under different loading conditions.

Keyword: Deep beam; Strut effective strength; Dynamic; Strain rate; Shear strength; Strut-and-tie model